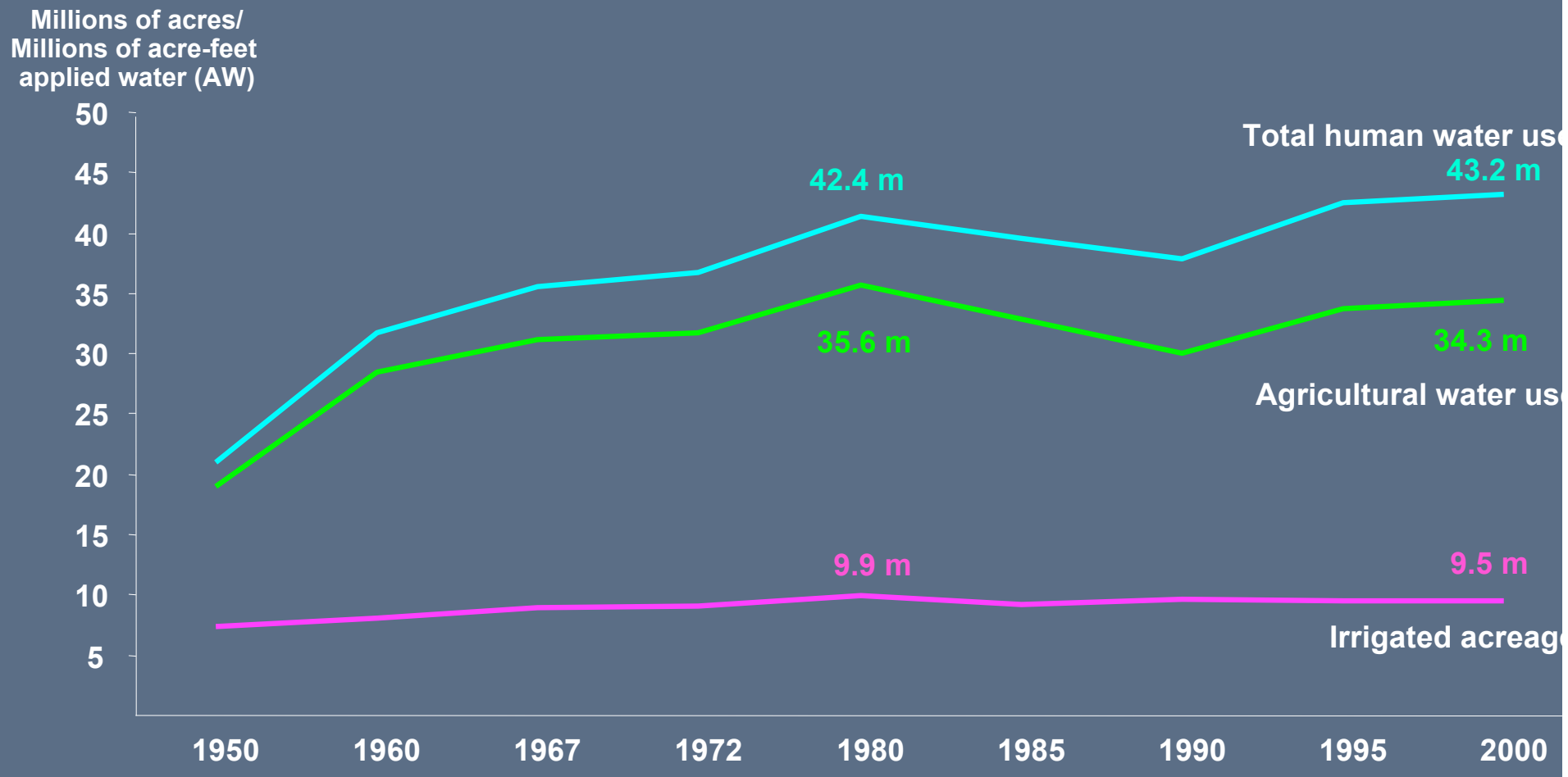
Growth, Environment and Efficiency: California's Water Future

Prof. Dave Sunding

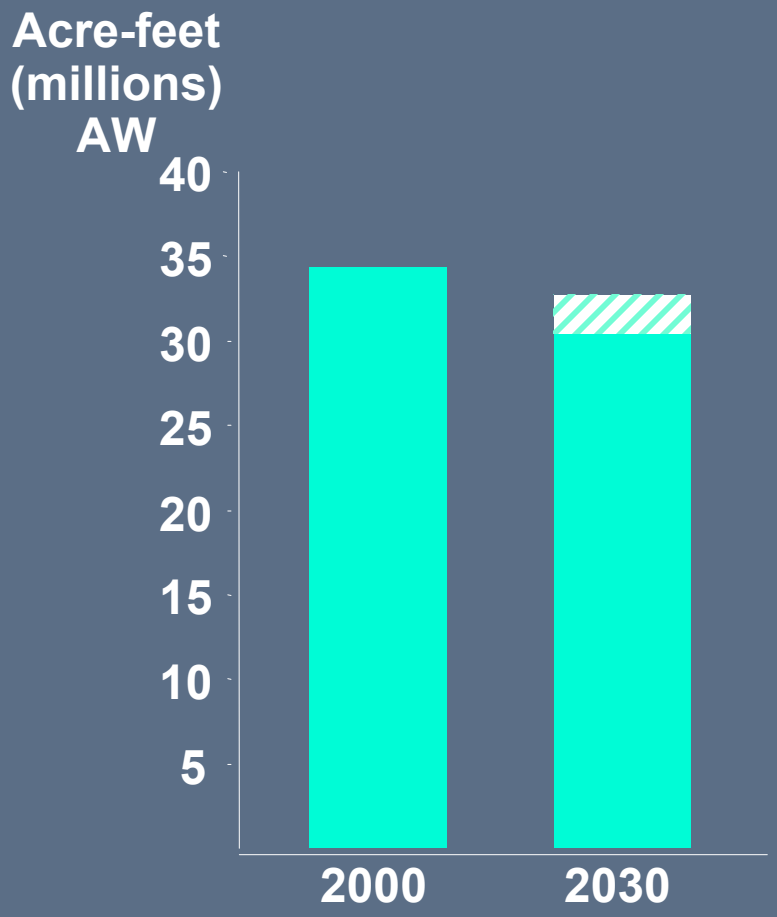
October 7, 2006

Agricultural and total water usage in CA



Source: Various CA water plans

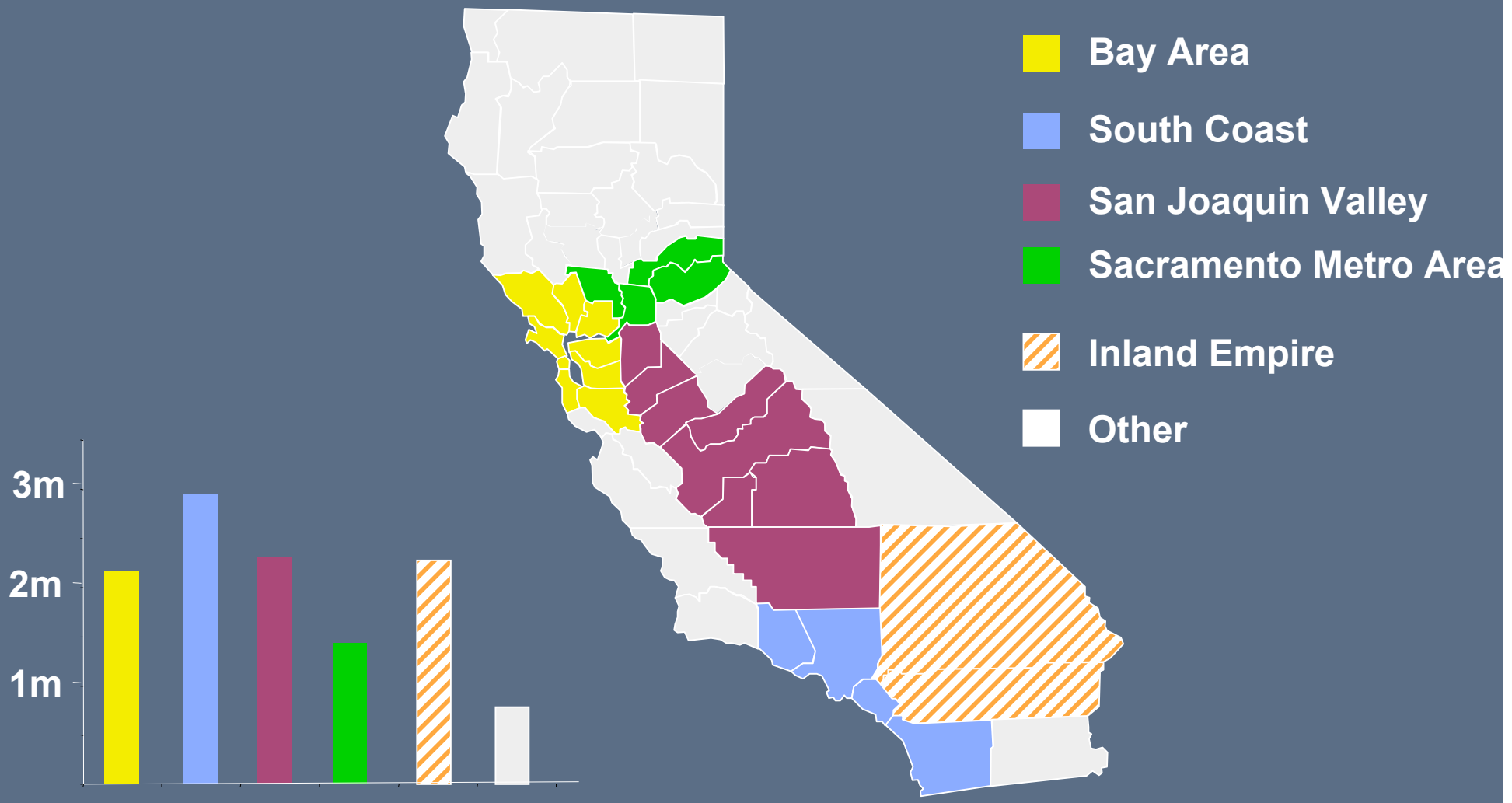
Agricultural water usage through 2030



- Market forces
  - Crop shifts
  - Irrigation efficiency
- Opens potential for
  - Transfers
  - Basin recharge

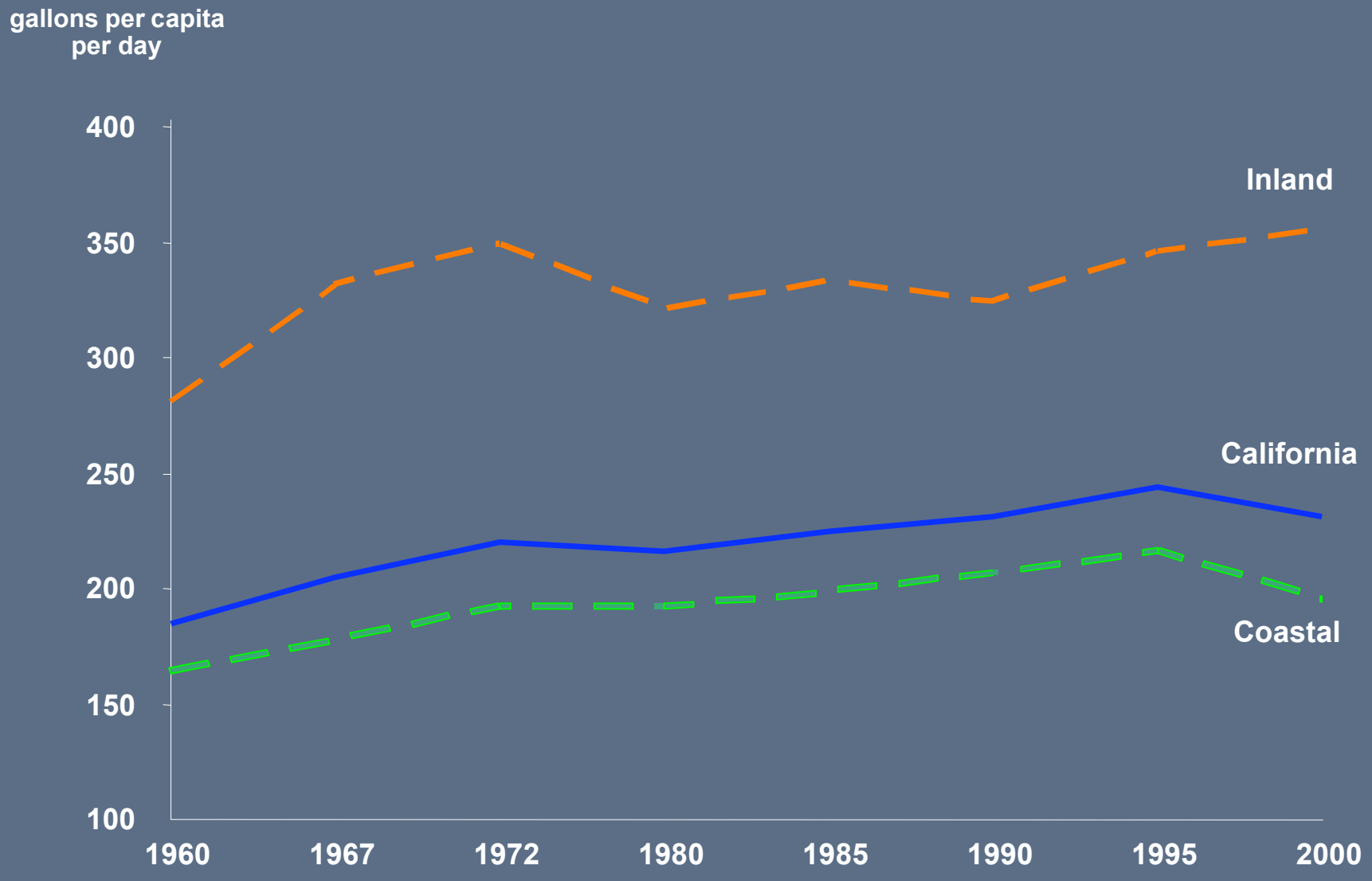
Source: California Water Plan Update, 2005

Population growth through 2030: Most growth away from coast



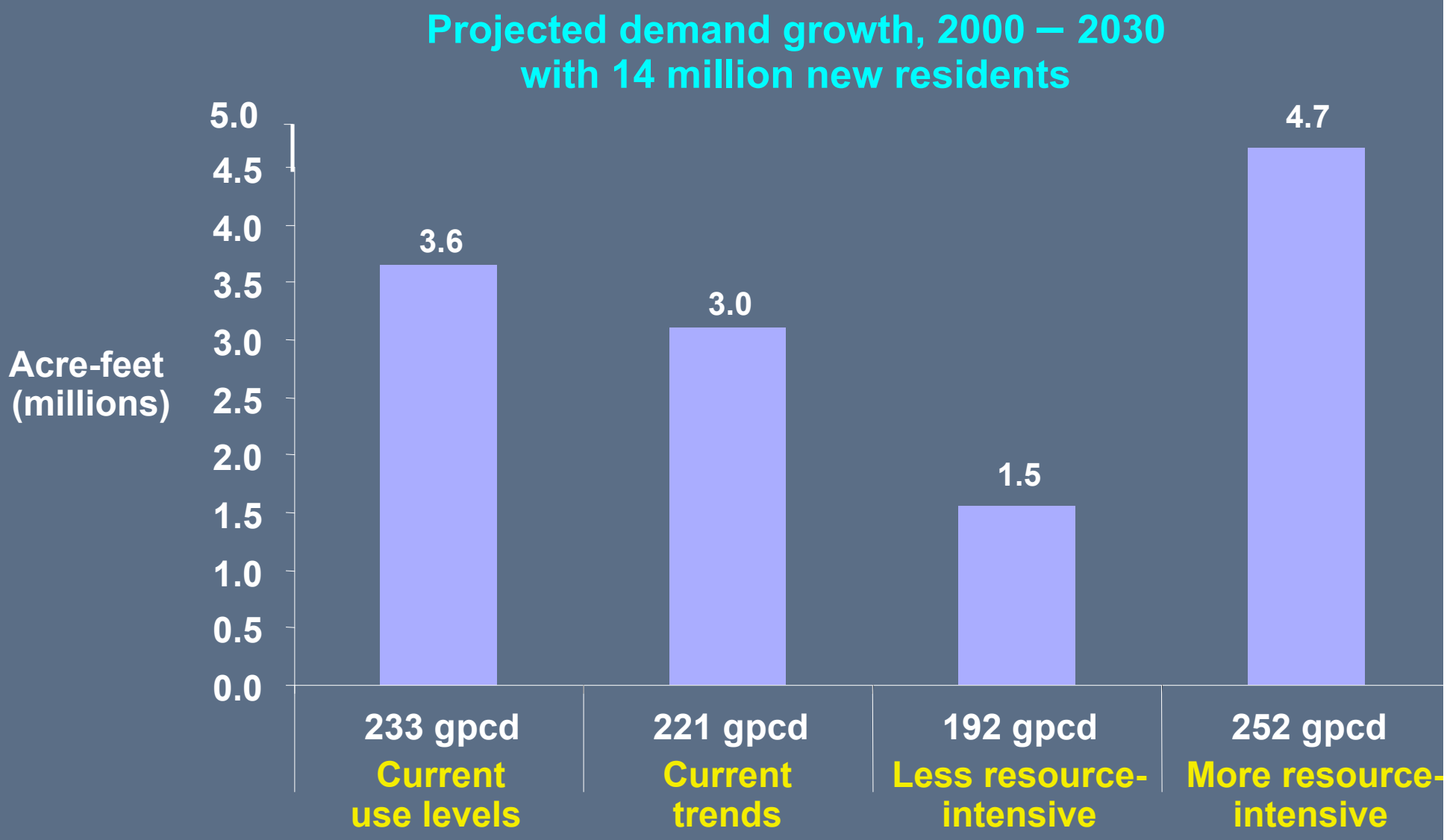
Source: Department of Finance, 2004

Per capita urban use has only recently begun to fall; inland use is much higher



Source: various CA water plans

Urban demand growth is highly variable

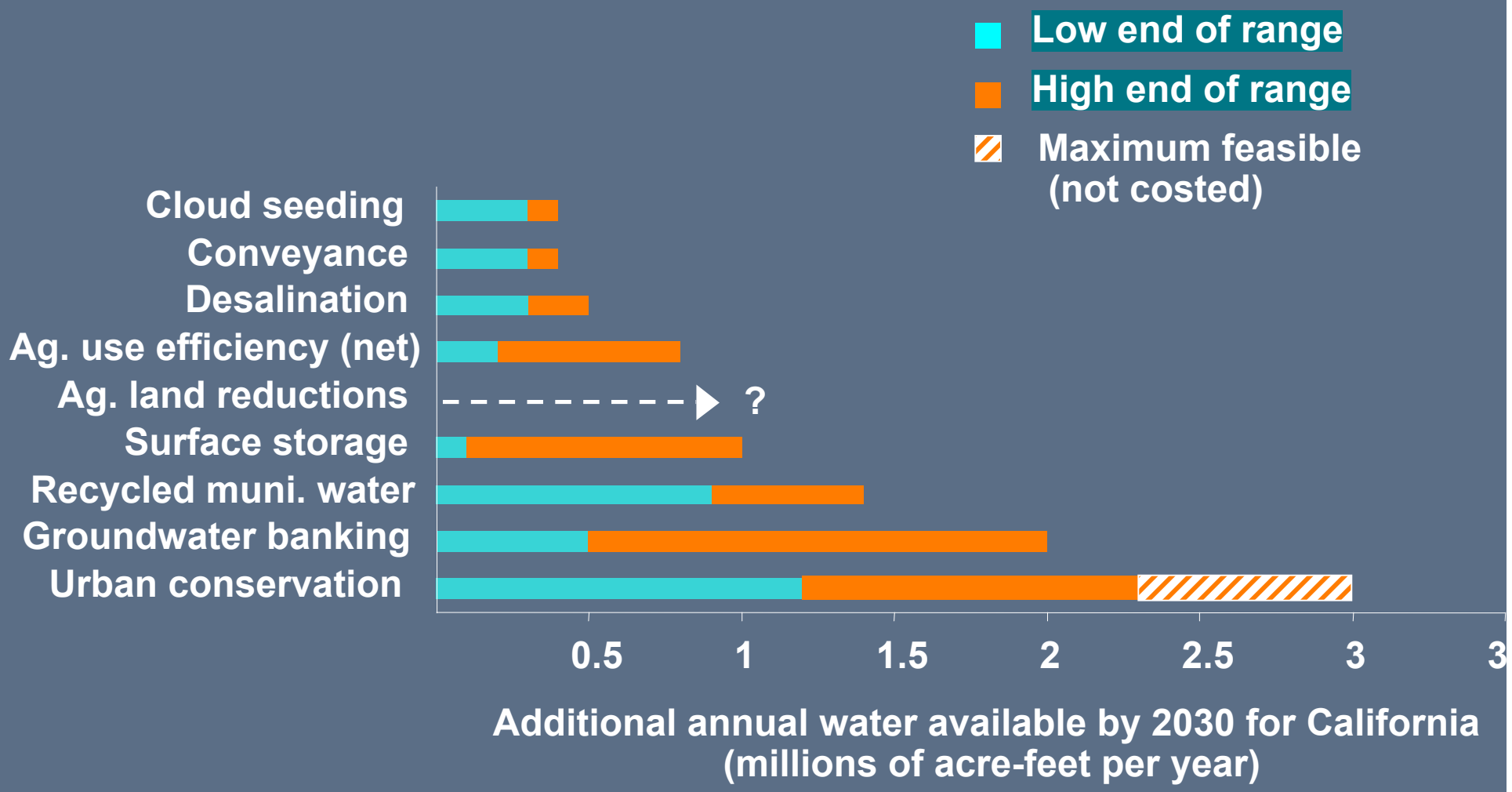


Source: California Water Plan Update, 2005

Other anticipated adjustments

- Increased environmental flows (+ 1 maf?)
- Reduced Colorado River use (- 0.8 maf)
- Reduced groundwater overdraft (1-2 maf?)

State recognizes that many options available for generating new supplies



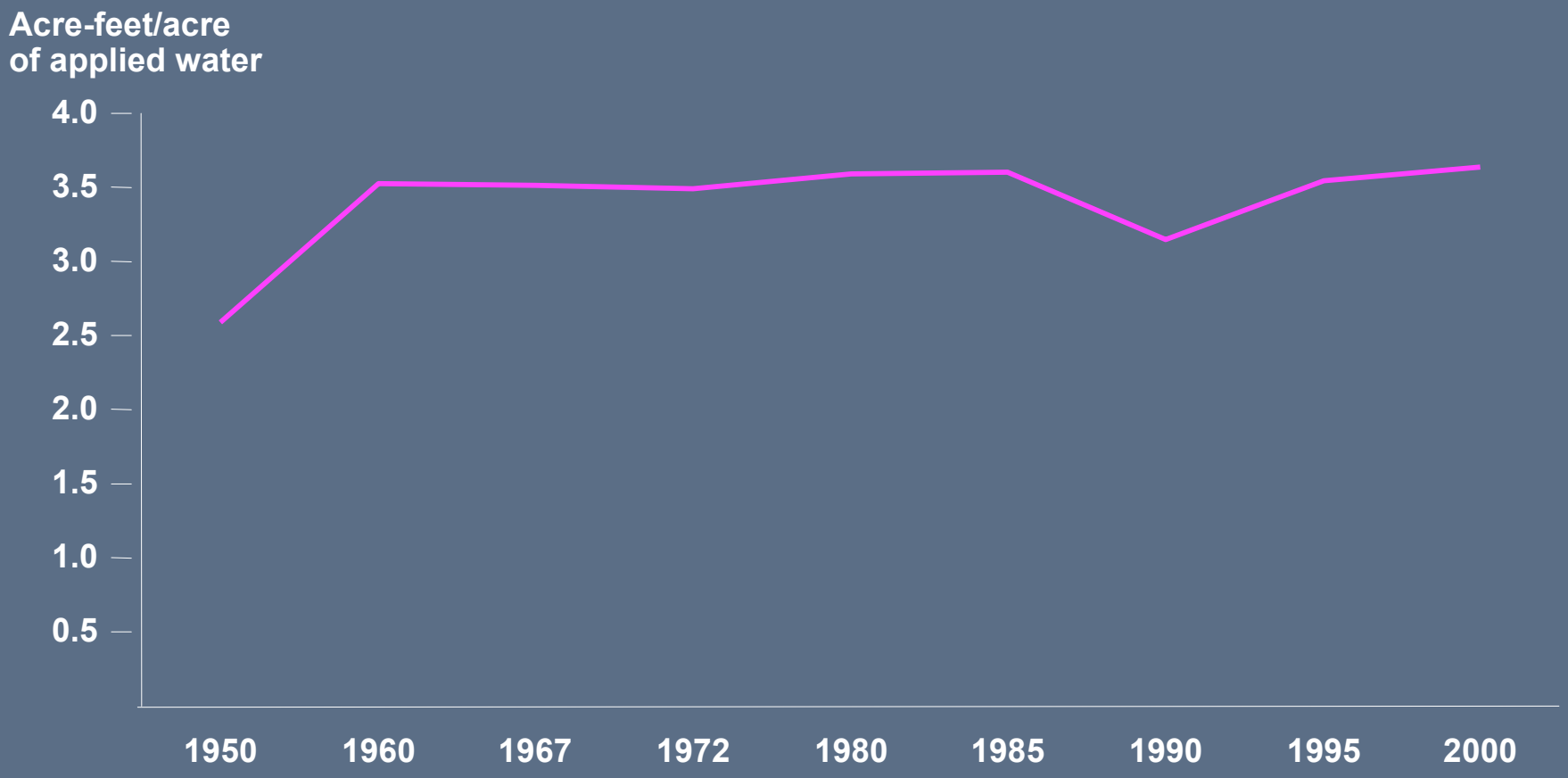
Source: California Water Plan Update, 2005

Some incremental water sources are relatively low cost

	Cost/af
Cloud seeding	$19*
Desalination (seawater)	$800 - $2,000 *
Ag. use efficiency	$175 - $450*
Ag. land fallowing	$75 - $400 *
Surface storage	$150 - $2,500 *
Recycled muni water	$300 - $1,300*
Conjunctive use & GW banking	$110 +*
Urban conservation	$220 - $530 *

* California Water Plan, 2005 * CALFED, 1999 * author estimates

Irrigation water application has hovered in range of 3.5 – 3.6 acre-ft/acre since 1960s



Source: various CA water plans

Agricultural efficiency is not well understood from a policy perspective

- Usual view is that farm efficiency improvements do not achieve much since they reduce return flows, which are usable
- Value of water depends on where it is located, and its quality
- Efficiency investments can increase yields - do more than just reduce return flows
- Need for more research on this topic

Water transfers are an important part of reconciling supply-demand imbalances

- Wide variety of deals; permanent vs. temporary; firm vs. interruptible; fallowing vs. efficiency conservation
- Great interest in agriculture to sell water; also lots of trades within agriculture
- Suppose 3 maf transferred from ag to urban uses by 2030; at current prices, this is a $500 - $900 million annual market in California

Infrastructure improvements may be more important than new storage

- Huge disparities in regional water productivity, even within agriculture
- North-south and east-west differences
- Productivity differences persist due to nature of water rights and lack of conveyance opportunities
- Almost total lack of private investment in water infrastructure
- No regulatory apparatus for common carriers in water and no market for wheeling

Groundwater banking and conjunctive use can enhance supply at reasonable cost

- Historical overdraft has created lots of storage space
- Simple banking can create opportunities for arbitrage
- Development of wellfields can also allow for more aggressive management of surface storage facilities
- A major problem with groundwater storage is flexibility

Curbing urban outdoor use may be low-hanging fruit

- Outdoor water use in rapidly growing inland regions often exceeds 50% of total use
- Residential irrigation efficiencies very low
- Urban utilities are exploring use of “smart” ET controllers – field trial savings 15-25%
- Need better data on weather and water needs of landscape plants (CIMIS)

Urban recycling is promising

- Urban conservation is desirable since it creates water in exactly the right place; no need for expensive conveyance
- Recycled water can be used for landscape irrigation and industrial applications
- Cost is relatively modest, ranging from $300 to $1,300/af

Improvements in information and modeling can aid more aggressive management

- Disparate sources of of information on hydrology, geology, economics, land use, biology and other relevant factors
- Also lack of integration among system models
- Many opportunities for analysis and management are lost
- UCB partnership with Microsoft

California Water: A Non-Crisis

- Much room for more efficient management
- Some increase in storage may be needed, particularly in the face of climate change
- State should aggressively push urban recycling, desalination is a supply of last resort
- Investments in conveyance infrastructure also have high returns

Berkeley Water Center

- The Berkeley Water Center's mission is to study the most challenging problems facing water resource managers, and to develop 21st century tools to solve them.

Berkeley Water Center

- BWC is a joint venture among COE, CNR and LBNL.
- Over 100 Berkeley faculty and LBL researchers involved in water
- Span over a dozen departments and academic disciplines

Research Thrust Areas

- Digital Watersheds
- Cal 2030
- Clean Water and Sanitation

Initial Funding

- Industrial Support ($2.0 million)
- Foundations ($2.2 million)
- Government ($1.4 million)
- Campus/LBL ($0.9 million)
- Total: $6.5 million